

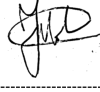
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1. Introduction

This document is intended to outline the technical requirements for stranded steel conductors used as earthwires or stays for Transmission lines.

2. Supporting Clauses

2.1 Scope

This specification covers the technical requirements for zinc-coated ground wire for use on Eskom's overhead Transmission lines. Details of requirements are given in schedule A of the enquiry document. Deviations and additions to the Normative specifications referenced in this document are a highlight of this document. This document does not cover the specifics for "guy wires" and cross ropes used for high voltage lines where they are considered part of supporting structure (tower or pole). This is covered in the tower specification generated per project.

2.1.1 Purpose

This standard is to be used for the technical requirements when acquiring any type of steel stranded conductor to be used as earthwire, guys or stays for overhead power lines.

2.1.2 Applicability

This document shall apply throughout Eskom Holdings Limited Divisions/ National Transmission Company South Africa SOC Ltd Reg No 2021/539129/30.

2.1.3 Effective date

From the authorisation date.

2.2 Normative/Informative References

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

- [1] ISO 9001 Quality Management Systems
- [2] SANS IEC 61089: 1991, Round wire concentric lay overhead electrical stranded conductors
- [3] SANS IEC 63248: 2022, Conductors for overhead lines- Coated or clad metallic wire for concentric lay stranded conductors.
- [4] SANS IEC 60889: 1987, Hard-drawn aluminium wire for overhead line conductors
- [5] 240-75521456: Phase Conductor for Transmission Lines
- [6] SANS IEC 61394: 1997, Characteristics of greases for aluminium, aluminium alloy and steel bare conductors
- [7] SANS10005: The Preservative treatment of timber

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2.2.2 Informative

N/A

2.3 Definitions

N/A

2.4 Abbreviations

Abbreviation	Explanation
N/A	

2.5 Roles and Responsibilities

The Engineer requiring steel stranded conductor should make use of this standard to specify the products.

Quality representatives releasing or inspecting completed products as mentioned in this document must use the technical requirements stipulated herein to check products.

Compiler to ensure that all relevant end users are aware of this document.

2.6 Process for Monitoring

N/A

2.7 Related/Supporting Documents

N/A

3. Requirements

3.1 General

All specifics of this steel wire and final product must be in accordance with SANS IEC 61089: 1991 and SANS IEC 63248: 2022. All other technical requirements not mentioned in this document are as per the above-mentioned specifications.

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3.2 Product

The ultimate tensile strength of the steel material used for the wires, minimum breaking strength of the finished strand, nominal diameter of the strand, and strand construction shall be as specified in Schedule A1 and Schedule A2 of this document. In some instances, a defined schedule will be attached for a particular project which must be catered for.

3.3 Fabrication

3.3.1 Lay Ratio

Lay ratio shall be as follows:

- For the 6-wire layer of the 7 and 19- wire steel cores shall be not less than 16 and no more than 26.
- For the 12-wire layer of 19-wire steel core shall be not less than 14 and no more than 22.

3.3.2 Material

As per clause 4 of SANS IEC 63248: 2022.

3.3.3 Joints

As per clause 6 of SANS IEC 63248: 2022.

3.4 Greasing

Steel wire used for coastal and other pollution environments shall be greased using Eskom accepted conductor grease using case 4 method as per SANS IEC 61089:1991, i.e. All voids between the strands shall be filled with grease except the exterior part of the outermost layer of strands forming the outer surface.

For Transmission ground wire, Castrol BJ 20 is commonly used and approved grease. Specifications and test results for alternative greases should be submitted for approval prior to manufacture.

3.5 Packing Requirements

3.5.1 Lengths per drum

The length of the earth conductor, on each drum shall be in accordance with the length specified in the item description or Project Bill of Materials (BOM).

3.5.2 Drum details

All steel wire of length exceeding 100 metres shall be supplied on returnable steel drums or non-returnable wooden drums. Project requirements will prescribe the drum type, but non-returnable wooden drums are prescribed.

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3.5.3 Winding on drums

For multi-layered constructions, the steel wire shall be wound onto the drums to form complete layers. Each layer shall fill the width of the drum before the next layer is wound on. Drums not wound in this manner will be rejected. Conductor drums where steel wire gets damaged when taken off the drum due to an incorrectly wound conductor shall be replaced by the manufacturer at own cost.

3.5.4 Securing method

An acceptable method of holding the conductor end shall be used, to ensure that no relative movement of steel wire occurs between the uppermost uncompleted layer and the completed layer directly below it. Details of the proposed holding method shall accompany the tender offer and shall be subject to Eskom's approval.

3.5.5 Waterproofing

Heavy weatherproof paper, cardboard or other suitable material shall be placed between the steel wire and barrel and flange surfaces of steel drums. This material shall remain attached to the drum during unreeling.

3.5.6 Lagging on drums

Wood lagging shall be used to protect the steel wire. Four steel straps shall be used to secure the lagging on steel drums. The battens shall be nailed to the flanges of wooden drums and two steel straps shall be provided around each drum to prevent easy removal of the battens. The length of the nails used shall be at least 10 mm less than the distance from the outside of the battens to the top of the steel wire on the drum. Care shall be taken to prevent the nails from protruding through the surface of the flange.

3.5.7 Protection methods

When steel wire is to be transported over long distances certain measures as described within the actual tender documents must be adhered to protect the product against damage and corrosion. This type of protection must be stipulated by the supplier and will be approved by Eskom before any shipment is initiated. The supplier of steel wire must arrange the arrival dates and times of shipments with Eskom Transmission / Distribution Quality Assurance so that the steel wire can be land-tested before it is released.

3.5.8 Treatment of drums

Timber for wooden cable drums shall be treated as per ISPM 15 regulations.

Methods stipulated in this document are Heat Treatment and Methyl Bromide Fumigation.

3.6 Standard Drum Sizes

Non-returnable wooden drums shall have dimensions in accordance with Table 1. Any changes to dimensions that the supplier feels is necessary should be marked on drum drawings for approval by Eskom.

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Table 1. Standard drum sizes for steel wire

1	2	3	4	5	6	7	8	9	10
Designation	Steel wire Type and Application	Strand Diameter (mm)	Length (m)	Bending factor (m)	Drum size				
					All dimensions in mm				
					Flange diameter	Annex A Barrel	Width	Flange thickness (mm)	Spindle hole diameter (mm)
	19/2,70 (1310MPa) for HV Shield-wire	2,70	3000	30D	1500	500	900	76	92
	7/3,51 (1290MPa) for HV Shield-wire	3,51	3000	30D	1500	500	900	76	92

3.7 Steel wire sizes and MPa rating

See Table 2 below.

Table 2. Steel wire sizes and MPa Rating data

Item Description	No. of Strands	Diameter of Strand (mm)	Nominal overall Diameter (mm)	St wire Tolerance (mm/strand l)	Max Tension (kN)	Specification
19/2,70 (1310MPa) for HV Shield-wire	19	2,70	13.50	± 0,04	142,5	SANS IEC 63248: 2022
7/3,51 (1290MPa) for HV Shield-wire)	7	3,51	10.53	± 0,05	87,4	SANS IEC 63248: 2022

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4. Tests

All Electrical and Mechanical tests shall be conducted according to SANS IEC 63248: 2022 and SANS IEC 61089:1991. The manufacturer / supplier shall also have independent type tests performed at SANAS accredited test facilities.

5. Marking and Labelling

5.1 Marking

5.1.1 Length on drum description

The actual measured length of earth conductor shall be marked on each drum. The accuracy of measurement shall be within -0% to +3% of the nominal drum length.

5.1.2 Nett mass

The actual (nett) mass of each earth conductor shall be marked on each drum.

5.1.3 Height of marking

The actual measured length and net mass of conductor shall be marked on each drum in black stencilled lettering of 50 mm height on the drum side, e.g. "19/2.65 – 1 500m – 225kg".

5.1.4 Previous marking deletion

All drum markings pertaining to a previous order shall be painted over or otherwise satisfactorily obliterated.

5.1.5 Eskom logo

All steel wire drums destined for Eskom projects shall be branded with Eskom signature (logo and logotype) on one of its flat sides (the flange).

The Eskom signature shall be printed in Eskom Blue or Black only on the white-coloured background.

For metal drums and wooden drums, a portion of the flange surface shall be painted in white to provide rectangular background on which the signature shall be printed in Eskom Blue or Black only. The width (or height) of the white rectangular background shall be three times the diameter of the "circle" part of the Eskom signature. The printed Eskom signature shall appear central onto the white rectangular background leaving a space equal to one signature "circle" on both front and back ends.

The Eskom logo printing shall be made using silkscreen technique or other equivalent techniques which shall be demonstrated to and approved by Eskom - IARC.

The dimensions of complete Eskom signatures shall be a minimum length and width (height) of 82 mm and 21 mm, respectively.

All other printing on the flange shall be positioned to ensure a minimum clearance of one logo "circle" diameter away from the Eskom signature.

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The copy of the Eskom signature and standard printing guidelines are shown in Annex A and B.

5.1.6 Red round marking

Red Round Mark: The Opposite end of a conductor drum (not bearing the Eskom logo) shall be marked (stamped) with a red circle of 200mm diameter to augment the logo for forensic purposes.

Acceptance

This document has been seen and accepted by:

Name	Designation
Faith Mokhonoana	Senior Manager- Line Engineering Services

6. Revisions

Date	Rev.	Compiler	Remarks
December2024	1	B. Haridass	New template, new specifications for products.

7. Development Team

The following people were involved in the development of this document:

- Dr. AS Jacobs

8. Acknowledgements

N/A

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Appendix A – The Eskom signature – printing guide and format

The Eskom Signature (logo and logotype) printing guide

The Eskom Signature (logo and logotype) must be used together as a unit. The logo (“circle”) and the logotype (the word “Eskom”) must always appear together as one unit.

a) Colour specifications:

The corporate signature may only appear in the Eskom corporate blue or in black or in white.

Pantone 287C

100%C + 70%M + 0%Y + 10%K

To match colours, swatches must always be used. Previously printed material must never be used for colour matching.

b) corporate signature isolation area:

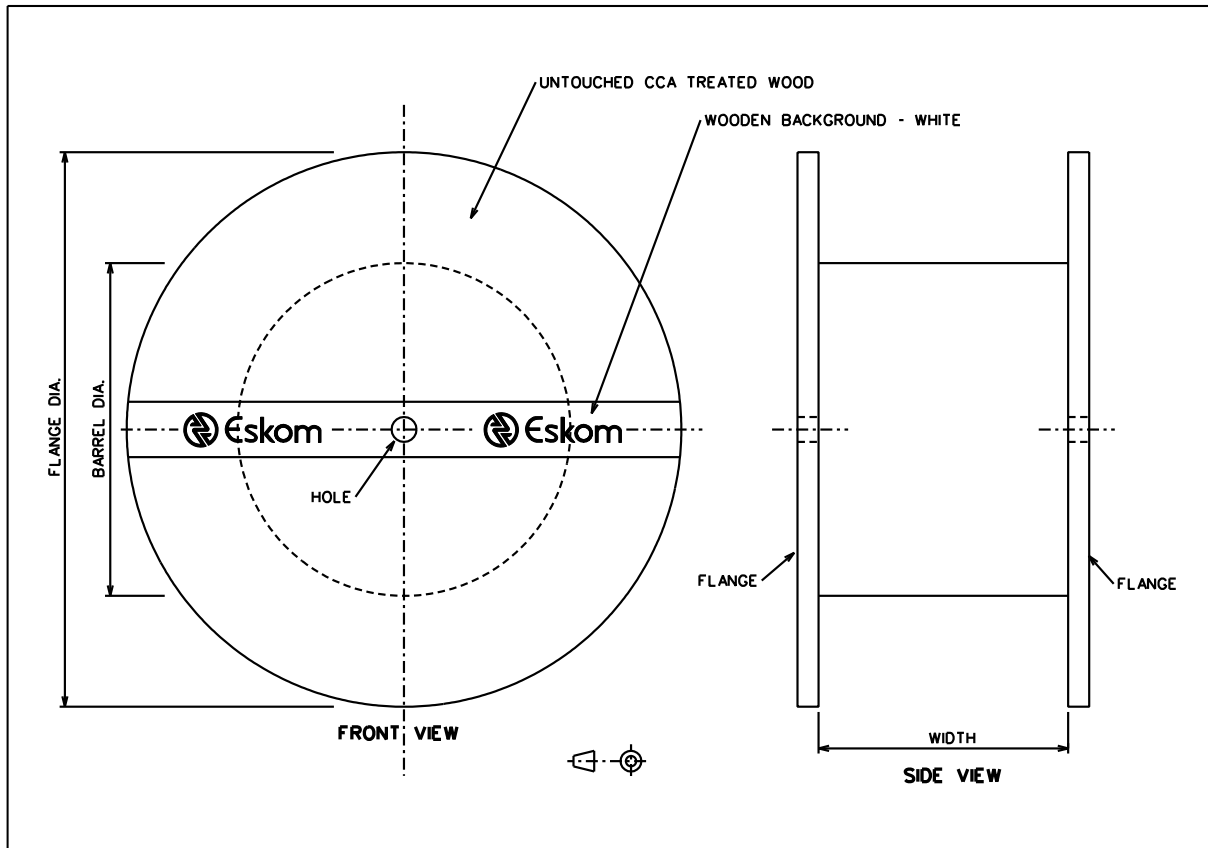
There should always be a minimum clear area around the signature. This minimum is equal to the full diameter of the logo (“circle”).

c) Relationship between the logo and the logotype:

The relationship between the logo and the logotype must always be followed exactly as indicated in the graphic. The measurement between the logo (“circle”) and the logotype (word “Eskom”) is twice the linewidth of the “circle.”

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Appendix B – Typical wooden drum showing Eskom branded flange



The Eskom signature (logo and logotype) format



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Appendix C – Schedule A1

19/2.7 Earth wire specifications

Conductor type (16-S1A-19/2,7)	Regular steel wire IEC Code 16-S1A-19	Supplier details
Conductor overall diameter (mm)	13,48	
Steel wires (number off)/ (strand diameter mm)	19/2,7	
Linear mass (kg/km)	857,0	
Minimum ultimate tensile strength (MPa)	1 310	
Ultimate Tensile strength (kN)	142,1	
Modulus elasticity final (MPa)	190 000	
Resistance (ohms/km)	1,794	
Coefficient of linear expansion, β , (1/°C)	$11,5 \times 10^{-6}$	
Drum Length (m)	3000m	
Total length (km)	See total works order.	
Greased (Castrol BJ20 or equivalent. Equivalent products subject to Eskom's approval. All layers must be greased except the outside)	See total works order for requirements.	

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Appendix D – Schedule A2

7/3.51 Earth wire specifications

Conductor type 1 (10-S1A-7/3.51)	Regular steel wire IEC Code 10-S1A-7	Supplier details
Conductor overall diameter (mm)	10.53	
Steel wires (number off)/ (strand diameter mm)	7/3.51	
Linear mass (kg/km)	533,2	
Minimum ultimate tensile strength (MPa)	1 310	
Ultimate Tensile strength (kN)	87,4	
Modulus elasticity final (MPa)	190 000	
Resistance (ohms/km)	2,86	
Coefficient of linear expansion, β , (1/°C)	$11,5 \times 10^{-6}$	
Drum Length (m)	3000m	
Total length (km)	See total works order.	
Greased (Castrol BJ20 or equivalent. Equivalent products subject to Eskom's approval. All layers must be greased except the outside)	See total works order for requirements.	

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